भारतीय मानक

IS 9393 : 2023

Indian Standard

वर्स्टेड, सेमीवर्स्टेड और ऊनी धागे के निर्माण और सहनशीलता की रीति संहिता

(पहला पुनरीक्षण)

Code of Manufacturing Worsted, Semi-Worsted and Woollen Yarns and Tolerances

(First Revision)

ICS 59.080.20

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June 2023 **Price Group 7**

Wool, Wool Products and Textile Floor Coverings Sectional Committee, TXD 04

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Wool, Wool Products and Textile Floor Coverings Sectional Committee had been approved by the Textiles Division Council.

This standard was first published in 1979. The first revision has been made in the light of experience gained since its publication and to incorporate the following major changes:

a) Amendment 1 has been incorporated in the standard;
b) BIS certification marking clause has been modified; and
c) References to Indian Standard given in Annex A has been updated.

The composition of the committee responsible for the formulation of this standard is listed in Annex C.

In reporting the results of a test or analysis made in accordance with this standard, if the final value, observed or calculated, is to be rounded off, it shall be done in accordance with IS 2 : 2022 ‘Rules for rounding off numerical values (*second revision*)’.

Indian Standard

CODE OF MANUFACTURING WORSTED, SEMI-WORSTED AND WOOLLEN YARNS AND TOLERANCES

(First Revision)

1 SCOPE

1.1 This standard specifies the sequence of processes involved in the manufacturing of worsted, semi-worsted and woollen yarn. It also specifies the methods of test and permissible tolerances for various characteristics, packaging, marking, packing and sampling of yarn.

1.2 This standard does not specify the counts, breaking load and twist of yarn. However, general information in respect of these is given in Annex B.

2 REFERENCES

The standards listed in Annex A contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards listed in Annex A.

3 TERMINOLOGY

For the purpose of this standard, the following definitions shall apply:

3.1 Worsted Yarn — A yarn spun from wool fibres or blends which have been carded, gilled and combed followed by gilling before spinning. In the worsted system, an attempt is made to lay the fibres practically parallel along with the length of yarn which gives it a reasonably smooth surface.

3.2 Semi-Worsted Yarn — A yarn spun from wool fibres or blends which have been carded and gilled before spinning. In the semi-worsted system, an attempt is made to lay the fibres somewhat parallel along the length of yarn, which gives it a slightly smooth surface.

3.3 Woollen Yarn — A yarn spun from wool fibres or blends which have been carded only before spinning. In the woollen system, the carding process opens out and straightens the fibres which generally cross each other in every direction presenting a rough yarn surface.

3.4 Metric Count — Number of 1 000 m hanks in one kilogram.

3.5 Tex — Mass of 1 000 m of yarn in grams.

4 SEQUENCE OF PROCESSES

The sequence of processes for worsted, semi-worsted and woollen system of spinning of wool yarn is given in **4.1**, **4.2** and **4.3** respectively.

4.1 Worsted System

The sequence of processes recommended for worsted system is given in Table 1.

4.2 Semi-Worsted System

The sequence of processes recommended for semi-worsted system is given in Table 2.

4.3 Woollen System

The sequence of processes recommended for woollen system is given in Table 3.

5 CHARACTERISTICS

The wool yarns shall be tested for the various characteristics by the methods given in Table 4. The permissible tolerances for these characteristics are also given in the table.

6 PACKAGING

The yarn shall be wound in hanks, cones or cheeses as agreed to between the buyer and the seller. Generally, the woollen yarn is wound in hank form while the worsted yarn is wound on cones and cheeses.

7 MARKING

7.1 The yarn packages shall be marked with the following:

a) Count of yarn;
b) Description of yarn, namely, worsted, semi-worsted or woollen;
c) Quality of raw wool/wool top;
d) Composition of yarn (*see* IS 1793);
e) Name of the manufacturer, initials or trade-mark, if any;
f) Month and year of manufacture; and
g) Any other information/instruction provided by the manufacture/required under law.

7.2 BIS Certification Marking

The product(s) conforming to the requirements of this standard may be certified as per theconformity assessment schemes under the provisions of the *Bureau of Indian Standards Act*, 2016 and the Rules and Regulations framed thereunder, and the product(s) may be marked with the Standard Mark.

Table 1 Recommended Sequence of Processes in Worsted System
(*Clause* 4.1)

Sl No. (1)	Name of the Process (2)	Effect of the Process (3)
i)	Sorting	Separation of fleeces into defined qualities
ii)	Blending	Mixing of different types of wools for distinctive effects and price
iii)	Scouring and cleansing	Removal of dirt and natural impurities by washing and cleansing processes
iv)	Drying	Elimination of superfluous moisture
v)	Carding	a) Opening out the wool tufts and laying the fibres in a uniform and dense web: dividing the web by a cutter into two; giving the web the shape of sliver and collecting the sliver in a can with the help of a coiler, ready for gilling.
		b) Taking out the burr/vegetable matter, dust and short fibres from wool; maintaining the mean fibre length.
vi)	Preparing	Preparation of long wools for combing by gilling
vii)	Backwashing (cleansing, drying and gilling)	Cleansing of the material and application of oil for lubricating the wool
viii)	Intermediate	Parallelisation of fibres by mechanical processes
ix)	Combing	a) Removal of short fibres not serviceable for worsted goods
		b) Effecting complete parallelisation
x)	Finishing gill boxes	Formation of sliver into a top (bell) of standard mass and length
xi)	Drawing	Regularisation and gradual reduction of the thickness of the top by a series of drafting and doubling operations
xii)	Spinning	Formation of a thread of the required count and turns per metre

Table 2 Recommended Sequence of Processes in Semi-Worsted System

(*Clause* 4.2)

Sl No. (1)	Name of the Process (2)	Effect of the Process (3)
i)	Sorting	Separation of fleeces into defined qualities
ii)	Blending	Mixing of different types of wools for distinctive effects and price
iii)	Scouring and cleansing	Removal of dirt and natural impurities by washing and cleansing processes
iv)	Drying	Elimination of superfluous moisture
v)	Carding	a) Opening out the wool tufts and laying the fibres in a uniform and dense web: dividing the web by a cutter into two; giving the web the shape of sliver and collecting the sliver in a can with the help of a coiler, ready for gilling. b) Taking out the burr/vegetable matter, dust and short fibres from wool; maintaining the mean fibre length
vi)	Gilling	Parallelisation of fibres by mechanical process
vii)	Drawing	Regularisation and gradual reduction of the thickness of the top by a series of drafting and doubling operations
viii)	Spinning	Formation of a thread of the required count and turns per metre

Table 3 Recommended Sequence of Processes in Woollen System
(*Clause* 4.3)

Sl No. (1)	**Name of the Process** (2)	**Effect of the Process** (3)
i)	Sorting	Separation of fleeces into defined qualities
ii)	Blending	Mixing of different types of wools for distinctive effects and price
iii)	Scouring and cleansing	Removal of dirt and natural impurities by washing and cleansing processes
iv)	Drying	Elimination of superfluous moisture
v)	Carding	a) Opening out the wool tufts and laying those fibres in a random manner and dense web; dividing the web by certain means either condenser tapes or condenser doffer into uniform web strips of small width; giving a false twist to impart a certain strength to these strips; collecting these strips on to a package ready for spinning. b) Taking out the burr/vegetable matter, dust and short fibres from wool: maintaining the mean fibre length.
vi)	Spinning	Formation of a thread of the required count and turns per metre

8 PACKING

The yarn packages shall be packed by the method given in IS 32 or IS 741 as the case may be.

Table 4 Characteristics of Wool Yarn
(*Clause* 4.1)

Sl No. (1)	Characteristic (2)	Tolerance (3)	Method of Test, Ref to (4)
i)	Count	Average value shall lie within ± 4 percent of specified or marked value in case of worsted yarn and within ± 7.5 percent of specified or marked value in case of semi worsted and woollen yarn	IS 681
ii)	Breaking load:		
	a) Lea breaking load b) Single strand breaking load	Average value shall not be less than specified or marked value	a) 1969 (Part 1) b) IS 1670
iii)	Twist:		IS 832 (Part 1)
	a) Direction	'S' or 'Z' as specified or marked	
	b) Twist per metre	Average value shall lie within ± 7.5 percent of the specified or marked value	
iv)	Uniformity	Average number of twist of the package containing the highest average twist shall not be higher than that of the package containing the lowest average by more than 15 percent of the lower value	IS 832 (Part 1)
v)	Extractable matter, percent, *Max:*		IS 4390
	a) Worsted and semi worsted yarn:		
	1) Dry spun	1.75	
	2) Oil spun	4.0	
	b) Woollen yarn:		
	1) Blends having up to 50 percent wool	8	
	2) All wool or blends with more than 50 percent wool	10	
vi)	Commercial weight	Invoice weight shall not exceed the commercial weight by more than one percent	IS 4902

9 SAMPLING AND CRITERIA FOR CONFORMITY

9.1 Lot

The quantity of woollen, semi-worsted or worsted yarn of the same count and composition manufactured from the same quality of raw wool/wool top delivered to a buyer against a despatch note shall constitute a lot.

9.2 The conformity of the lot to the requirements of the standard shall be determined on the basis of the test results obtained on the samples selected from the lot. Unless otherwise agreed to between the buyer and the seller, the number of bales or cases to be selected at random for drawing the sample packages shall be in accordance with the col (1) and col (2) of Table 5. To ensure randomness of selection, methods given in IS 4905 shall be used.

9.3 The number of packages to be selected from each bale or cases elected according to **9.2** shall be five. The number of test specimens to be prepared from each package shall be such that at least 20 test specimens are available for carrying out the test for count, breaking load, twist and uniformity. The composite sample may be tested for extractable matter and commercial weight.

9.4 Criteria for Conformity

The lot shall be considered conforming to the requirements of this standard if the following conditions are satisfied:

a) The average count and twist of the test specimens lie between the relevant requirement;
b) The average breaking load value of the test specimen is not less than the specified or marked Value; and
c) All the test specimens subjected to the other tests satisfy the relevant requirements.

Table 5 Number of Bales or Gases to be Chosen from a Lot
(*Clause* 9.2)

Sl No. (1)	**Lot Size Bales or Cases** (2)	**Sample Size** (3)
i)	Up to 15	2
ii)	16 to 25	3
iii)	26 to 100	5
iv)	101 and above	8

ANNEX A

(*Clause* 2)

LIST OF REFERRED STANDARDS

IS No.	*Title*
IS 32 : 1971	Code for seaworthy packaging of woollen and worsted yarn and cloth (*second revision*)
IS 681 : 2015	Textiles — Methods for determination of universal count of woollen and worsted yarn (*first revision*)
IS 741 : 1971	Code for inland packaging of woollen and worsted yarn and cloth (*first revision*)
IS 1670 : 1991	Textiles — Yarn — Determination of breaking load and elongation at break of single strand (*second revision*)
IS 1793 : 1973	Guide for marking textile materials made of wool (*first revision*)
IS 4902 : 1981	Method for determination of correct invoice weight of all wool materials (*first revision*)
IS 4390 : 2001	Textiles — Method for estimation of solvent soluble matter in textile material (*first revision*)
IS 832 (Part 1) : 2021/ISO 2061 : 2015	Textiles — Determination of twist in yarns: Part 1 Direct counting method
IS 4905 : 2015/ISO 24153 : 2009	Random sampling and randomization procedures (*first revision*)

ANNEX B

(*Clause* 1.2)

GENERAL INFORMATION ON WORSTED AND WOOLLEN YARNS

B-1 COMMON COUNTS

B-1.1 Woollen

Universal count (approximate metric count/woollen count)

480 tex (Nm 2/4s)
400 tex (Nm 2.5/5s)
330 tex (Nm 3/6s)
240 tex (Nm 4/8s)
190 tex (Nm 5/10s)
165 tex (Nm 6/12s)
100 tex (Nm 10/20s)
64 tex (Nm 16/30s)

B-1.2 Worsted Yarn

Universal count (approximate metric count/worsted count)

89 tex (Nm 11/10s)
74 tex (Nm 13.5/12s)
63 tex (Nm 16/14s)
56 tex (Nm 18/16s)
50 tex (Nm 20/18s)
44 tex (Nm 23/20s)
40 tex (Nm 25/22s)
37 tex (Nm 27/24s)
34 tex (Nm 29/26s)
32 tex (Nm 31/28s)
30 tex (Nm 33/30s)
28 tex (Nm 36/32s)
25 tex (Nm 40/36s)
22 tex (Nm 45/40s)
17.5 tex (Nm 57/50s)
15.5 tex (Nm 64/56s)

B-2 BREAKING LOAD

B-2.1 The lea breaking load value is always less than the sum of the breaking load values of the single threads comprising the lea. The lea and single thread breaking loads can be compared by means of ratio '*R*' which is dependent on many factors like count, twist, etc.

$$R = \frac{\text{Average lea breaking load value}}{n \times \text{Average single thread breaking load value}}$$

where n is number of threads in the lea and it can be determined by the following formula:

$$n = \frac{2 \times \text{length of yarn in lea}}{\text{girth of lea}}$$

NOTE — Tex values are not exact equivalents of woollen and worsted counts, these are the rationalised values recommended by the International Organization for Standardization (ISO).

B-2.2 The ratio of lea and single thread breaking load value for different types of yarn is given below:

Type of Yarn	*Range of 'R'*	*Nominal Value*
Woollen	0.72 - 0.90	0.80
Single worsted	0.40 - 0.82	0.65
Two-fold worsted	0.67 - 0.94	0.80

B-3 TWIST

B-3.1 In general, the fibres in the yarn are twisted to the same angle throughout and hence the product of turns per metre and the square root of yarn in tex is kept constant. The formula, given below, thus helps in determining twist in yarn:

$$\text{Turns per metre} = \frac{\text{Twist constant}}{\sqrt{\text{tex}}}$$

B-3.2 Single Yarn

The twists in yarn depend upon the type of processing, quality of wool and the end uses. The twist constant provides a guide to the order of magnitude of twist generally accepted for some end uses.

B-3.2.1 *Woollen Yarn*

In general, the twist constant for different woollen yarns lay within the limits given below:

Twist Designation	*Twist Constant*
Hard twist Greater than	5 400
Medium hard	4 600 - 5 400
Normal warp	3 800 - 4 600
Normal weft	3 000 - 3 800
Soft	2 200 - 3 000
Very soft	Less than 2 200

B-3.2.2 *Worsted Yarn*

A general guidance can be had from the following formula:

$$\text{Turns per metre} = \frac{5\,600\,K}{0.73}\ \text{tex}$$

The value of '*K*' depends to some extent on the performance for which the yarns are required. However, the yarn intended for use as a single yarn would generally be spun with higher twist than otherwise.

B-3.3 Double Yarn

Two-fold worsted yarns have the folding twist in the opposite direction to the spinning twist.

ANNEX C

(*Foreword*)

COMMITTEE COMPOSITION

Wool, Wool Products and Textile Floor Coverings Sectional Committee, TXD 04

Organization	*Representative(s)*
ICAR - Central Sheep & Wool Research Institute, Avikanagar	Dr D. B. Shakyawar **(*Chairperson*)**
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Ahujasons Shawlwale Pvt Ltd, New Delhi	Shri Puneet Ahuja
All India Carpet Manufacturers’ Association, Bhadohi	Shri Ravi Patodia Shri Surenda K. Baranwal (*Alternate*)
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Export Promotion Council for Handicraft, New Delhi	Shri Rajesh Rawat
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